ZOOLOGY.

Animal Coloring Matter.—C. A. McMunn (*Jour. Marine Biol. Assn. United Kingdom*, No. 1,) discusses briefly the coloring matters of several invertebrates. Among the interesting facts are these Spectroscopic examination fails to show the presence of symbiotic algæ in *Antedon*, it being found that contrary results were due to the presence of plants in the food, and that when the stomach was removed neither chlorophyll nor chlorofucin occurred in the extract. The digestive glands of echinoderms and crustacea not only form digestive ferments but exercise a chromatogenic function. Chlorophyll was found in several annelids, while other green worms possessed no chlorophyll. The lipochromes in some cases may act as an absorber of light rays, but its other function is very uncertain. The author shows that a knowledge of invertebrate coloring matter is absolutely essential to a clear understanding of the physiological action of the pigments of the Vertebrata.

The Polynoina.—H. Trautzsch discusses (*Jena. Zeitsch.*, XXIV., p. 61) the Polynoid worms of Spitzbergen. Eleven species are enumerated, of which one (*Harmothaë vittata*) is new. The generic limits are discussed, the genera of Malmgren, Levinsen, Kallenbach being considered. In the second part of the paper the morphology and physiology of the Nephridia are reviewed. The conclusions are as follows: In their simplest form the Nephridia are open saccular organs of the usual polychæte type, perforating the dissepiment, and opening exteriorly at the apex of a murally placed papilla on the hinder margin of the segment. Each nephridium is composed of funnel, inner loop, nephridial sac, outer loop and papilla; there being but a pair of nephridia in a segment, and each having but a single external opening. Nephridia are present in all segments, showing differences in each, and also between right and left. In the young animal all the Nephridia are essentially the same, but before and during the sexual maturity all except the first four pairs become more complex. All of the Nephridia are excretory organs, and the first four have no other function, and become genital ducts at the time of sexual maturity, the sexual products being forced to the exterior through the contractions of the surrounding muscles.

Reproduction of Fishes.—Mr. J. T. Cunningham gives (*Jour. Marine Biol. Assn. of the United Kingdom*, No. 1) the results of his studies of the ova, times of spawning, etc., of a number of British fishes. The paper will prove of considerable value to American students in the identification of the eggs and embryos of fishes. In the case of the mackerel, Mr. Cunningham found that no circulating apparatus served to keep the eggs, the density of the water possibly having considerable to do with the fatality. The mantle of cells which surround the oil globule at a later stage of the egg is regarded as formed of "periblastic syncytium." The egg regarded by Agassiz and Whitman as belonging to the smelt (*Osmerus mordax*) is said to belong to one of the Clupeoids. The fact is noted that fishes with much fat are apt to have oil globules in the eggs, while allied species with dry flesh have no oil globules. Some notes are given on the cœlom and vascular system. Six plates illustrate the paper.

The Halosauroid Fishes Typical of a Special Order.—Among the numerous representatives of the deep sea, or bassalian, fauna, one of the most characteristic is the family of Halosaurids. This family has been approximated by most ichthyologists to the Notopterids and Alepocephalids and their supposed allies. The external characters are however so peculiar, as manifested in the opercular apparatus and suborbital chain, that in 1883 I was convinced that the family represented a very distinct subordinal or ordinal group. Dr. Günther, in 1868 (Cat Fishes, B. M., vii., 482), assigned to the genus Halosaurus, a preoperculum produced behind into a long, flat process, replacing the sub- and interoperculum. The improbability of such a coalescence of the preoperculum and suboperculum, in view of our knowledge of the genesis and development of those bones, was so extreme that I availed myself of the first opportunity to examine the facts in the case. At Wood's Holl, in 1883, I uncovered the bones sufficiently to detect the true preoperculum, and to recognize that the supposed "preoperculum" of Günther was the exact homologue of the suboperculum. I deferred publication of any conclusions as to the affinities of the genus, however, till I could examine the skeleton. Meanwhile, a notice and illustrations of the skull and scapular arch of the genus have been published by Dr. Günther (Challenger Deep-Sea Fishes, pp. 232-236, Pl. 60, Figs. 1–8.) Dr. Günther at last recognized the true homologues of the opercular apparatus, but has not appreciated the systematic import of the facts disclosed. The peculiarities revealed by the skeleton are however numerous and important. Averse as I am to the multiplication of ordinal groups, it seems to me that in a system

of fishes based on morphological facts, the salient differences between the Halosaurids and other fishes must be expressed by an ordinal, or at least a subordinal, designation. I do not see how the group can be referred to any of the existing orders with the characters we now assign to them, and for the present, at least, propose to isolate it as a peculiar order characterized by the following features contrasted with those of the generally recognized orders:

LYOPOMI.

Teleosts with the scapular arch constituted by the proscapula, postero-temporal and post-temporal, the post-temporal discrete from the side of the cranium, and impinging on the supra-occipital; the hypercoracoid and hypocoracoid lamellar, and the fenestra or foramen in the upper margin of the hypocoracoid; the mesocoracoid absent; the actinosts normal; the cranium with the condyle confined to the basi-occipital; the opercular apparatus characteristic; the preoperculum being entirely detached from the suspensorium rudimentary, and connected only with the lower jaw; the operculum normally connected; the suboperculum enlarged and partly usurping the usual position of the preoperculum, in company with the suborbital chain, which is extended backwards toward the opercular margin; jaw bones complete and normal; palatines, entopterygoid, and ectopterygoid normally developed; the anterior vertebræ separate, and the ventrals abdominal.—THEO. GILL.

The Notocanthid Fishes as Representatives of a Peculiar Order.—The genus *Notocanthus* has long been shifted from place to place without finding a natural resting-place. It was indeed long ago suggested by Dr. Günther that "these fishes will, no doubt, have to be placed in a distinct order;" but he has neglected to do so, or to give any reasons why he thought so. The facts now known, however, warrant the isolation suggested, and the order may be defined by the following characteristics:

HETEROMI.

Teleosts with the scapular arch formed by the proscapula and post-temporal (or posterotemporal), the latter detached from the sides of the cranium, and impinging on the supraoccipital; the hypercoracoid and hypocoracoid coalesced into a single lamellar imperforate plate; the actinosts normal; the cranium with the condyle confined to the basioccipital (ill defined); the exoccipitals coalesced with the epiotics and opisthotics; the vomer obsolete; the opercular apparatus com-

plete, but the preoperculum slightly connected with or discrete from the suspensorium; the suborbitals suppressed; the jaw bones complete and little aberrant; the palatines, entopterygoids, and ectopterygoids well developed; the anterior vertebræ separate, and the ventrals abdominal.—THEO. GILL.

Note on Carettochelys, Ramsay.—Of this very remarkable Chelonian, which was found in Fly River, New Guinea, only a single specimen is known. It was described by Ramsay, in 1886, in the Proc. Linn. Soc., New South Wales, and compared with Emyda, with the remark that it appeared to be a link between the river, and the sea-turtles. Mr. Boulenger has placed it among the Pleurodira, in a new family, Carettochelydidæ.

The question is, Is it really a Pleurodiran? It is true it belongs to the Papuasian region, in which, so far, only Pleurodira have been found. There are some characters, however, not seen in the Pleurodira, but in another group of Chelonians consisting of the families Cinosternidæ, Staurotypidæ, and Pseudotrionychidæ. It is only in this group that we find 21 peripheralia (marginal bones) as in Carettochelys; the neural bones are also reduced, and the dermal shields have disappeared entirely in Pseudotrionx; to the latter character, however, I attach little value, as it may occur in any family.

It seems to me that the systematic position of Carettochelys is far from being clear. How easily could the whole question be settled! Mr. Ramsay would do a great service to science if he would undertake to have the cervicals and the skull extracted, or the cervicals alone, if he fears for the skull. This could be done without injuring the specimen, and the structure of these parts would show at once the affinities of this peculiar genus.

It is a pity that in some museums of natural history the anatomical knife is still an instrument without use. Rare or unique specimens are not allowed "to show the inside," or, in other words, to show what they really are. They are simply placed in alcohol or stuffed, to be presented to a public which has no understanding of them. There are exceptions, I am glad to say. One of these is seen in *Chlamydosclache*, of a single specimen which came to the Museum of Comparative Zoölogy, Cambridge, Mass., and was "sacrificed" to the anatomical knife. The result is known to every zoölogist.—G. BAUR.

Teeth of Monotremes.—Mr. Oldfield Thomas, (*Proc. Roy. Socy.*, No. 280) has had an opportunity to study the teeth of Ornithorhynchus, and comes to conclusions which essentially modify those of Poul-

ton. He finds that the true teeth are functional for a considerable part of the animal's existence, cutting the gum as usual, and, after being worn down by friction with food and sand, are shed from the mouth as are the milk teeth of other animals. The later cornules, or horny teeth, are certainly developed from the epithelium of the mouth cavity; but from that *under* and *around* instead of over the teeth, and the hollows in the horny plates are the vestiges of the original alveoli of the teeth, from out of which the latter have been shed. A result of this discovery is that we now have perfect calcified teeth large enough to be studied with the naked eye, and hence available for comparison with other forms. Mr. Thomas, aided by Lydekker and Boulenger, fails to find any teeth of recent or fossil reptiles or mammals which quite correspond to those of Ornithorhynchus. He is more and more inclined to believe in the correctness of the view of Prof. E. D. Cope, that the Multituberculata were monotremes, although the resemblances between the teeth are of the most general character.—J. S. K.

Zoological News.—Sponges.—The third and fourth part of the 48th volume of the *Zeitschrift für wissenschaftliche Zoologie* is devoted entirely to sponges. Conrad Keller devotes 95 pages and six plates to the sponge fauna of the Red Sea, and R. von Lendenfeld 296 pages and 15 plates to the physiology of these forms. His experiments consisted in feeding these forms carmine, starch, and milk, and in trying the effects of various poisons upon them. Among the conclusions are the following: The collar-cells absorb all that comes to them, holding the good and rejecting the useless. The canal system is physiologically comparable to that of polyps and medusæ, while physiologically the sponges are the closest of all animals to the plants.

Worms.—Arthur E. Shipley describes (Proc. Roy. Soc., No. 280) the structure of the Bahaman Gephyrean, *Phymosoma varians*. The points elucidated are the existence of skeletal structures at the anterior end of the body serving to support the tentacles and giving insertion to the retractor muscles; the alimentary canal; vascular system; nephridia, nervous system, sense organs, and reproductive organs. He thinks the points found confirm the arrangement of Phoronis near the Gephyrea in Ermis.

Vertebrates.—J. Beard has a preliminary notice of the early development of *Lepidosteus osseus* in the Proceedings of the Royal Society, No. 280. He obtained his material in northern New York. Among the points obtained are these: There is no neurenteric canal.

In the deevlopment of the nervous system there are formed transitory giant ganglion cells which are shut out of the central nervous system and persist for a long time lying outside the cord. They apparently form a transitory larval nervous system, possibly analogous to the subumbrellar cells described by Kleinenberg as ushering in the permanent ventral cord in Lopadorhynchus.

In the *Verhandlung* of the third meeting of the German Anatomical Soclety, Karl Bardeleben presented evidence for the existence of a sixth normal toe in the Mammalia. He finds in the skeletons of several forms bones on the radial side of the hand which he regards as evidence of a finger outside of the thumb, to which he gives the name prepollex; the corresponding structure in the foot is the prehallux. The existence of these additional digits has been seriously questioned, the bones being regarded as sesamoid. In *Pedetes capensis*, however, Bardeleben finds a true sixth finger which is furnished with a nail, and which seems to represent a thumb in function. Tornier, at the meeting, regarded these sixth fingers and toes in the Mammalia as physiologically new structures, not as ancestral features.

EMBRYOLOGY.

Evolution of the Medullary Canal.—Under this head we have to consider, first, what is the primitive vertebrate type of the central nervous system; second, what genetic relation existed between the vertebrate and invertebrate types.

The opinion generally accepted by embryologists is that the typical vertebrate canal is formed by the closure of the medullary groove. This view is advocated by Balfour, and has been so thoroughly accepted by Adam Sedgwick that he has made it the basis of a speculation[1] on the original function of the canal; he supposes that it was open behind and excretory; the cilia which are found in the central canal of the spinal cord originally served to produce the excretory current. This opinion overlooks the serious difficulty of assuming that the canal is primitive, while in the lowest vertebrates it is clearly a secondary modification. In Petromyzon, Lepidosteus and Teleosts, the medullary plate, instead of becoming the floor of an external groove, forms a solid keel-like projection towards the ventral

[1] A. Sedgwick. On the Original Function of the Canal of the Central Nervous System of Vertebrata. Proc. Philos. Soc. Cambridge, Eng. IV., 325–328.